Matter Asymmetry Genesis in the Z_N-companion Dark Matter Models

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Ref.~\cite{Guo:2021rre} proposes a class of $Z_{N \geq 3}$-symmetric WIMP dark matter characterized by the semi-annihilation into the companion of dark matter, evading the stringent direct detection constraint. In this work, we point out that such kind of models naturally provides the three Sakharov elements necessary for dark matter asymmetry, and moreover this asymmetry can be transferred to the visible sector with a proper link to the leptonic or quark sector. In our minimal Z_3 example, the migration to the leptonic sector is via the asymmetric companion decay into neutrinos, and the lepton asymmetry can be further transferred to the quark sector for heavy dark matter (
$gtrsim 3$TeV). In particular, the CP violation parameter in our model is suppressed in the limit of static annihilation of dark matter, and we, for the first time, study the lift from thermal motion. We make a preliminary numerical analysis based on the Boltzmann equations, to find that both correct relic density of dark matter and baryon asymmetry can be accommodated.

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